

# CHEMISTRY OF COAL

(2 ECTS) *Compulsory*

Responsible person: Dr. inż. Grzegorz S. Jodłowski

The aim of the subject is to acquire a fundamental knowledge on the structure, properties and chemistry of coal and carbonaceous materials. Students should: 1) understand coal structure models and the genesis of natural coal, carbonaceous materials sources and physical and chemical properties of coal and carbonaceous materials; 2) understand the influence of different parameters of coal structure on the applicability of coals; and 3) be able to carry out and interpret basic physico-chemical analyses of carbonaceous materials.

Learning outcomes:

Expected effect of the subject is knowledge of coal and carbonaceous materials genesis, composition and structure. Student should obtain the knowledge on:

structure and properties of allotropic types of carbon;

natural kinds of coal and carbonaceous materials;

genesis and metamorphism of coal and petroleum;

absolute basics of coal and petroleum geology;

models of coal structure;

composition of crude oil;

classification of fossil fuels;

physical and chemical properties of hard coal;

solvent analysis of coal or carbon materials;

coal degasification, gasification and liquefaction;

processes of coal burning and co-burning;

production, developing and application of porous carbonaceous materials;

properties of active coal, molecular sieves, activated cokes and relative materials;

carbon-mineral composites.

Predicted skills:

measurement of: coal density, enthalpy of burning, decoloring properties of active coal;

determination of: coal surface groups, porosity of coals or active coals.

## **Course main content:**

The course is built of two parts: lectures (15 h) and laboratories (15 h)

Lectures:

Introduction to coal technology, nomenclature and classification. Theory of coal and organic derivatives genesis and metamorphism. Modern models of coal structure. Lignite and hard coal structure and microstructure. Carbonaceous natural fuels classification and sources. Texture and chemistry of coal surface. Carbo-chemistry of coal (coal treatment). Introduction to coal liquefaction and gasification. Review of coal derivatives and semiproducts. Modern carbon materials.

Laboratory:

The determination of:

- Density of hard coal by pycnometry.
- Decolouring properties of hard and active coals.
- Wetability of hard coal.
- Specific surface area of hard coal.
- Elemental analysis of hard coal.
- Surface groups of hard coal.
- Self-ignition of hard coal.

**Literature:**

1. D.K. van Krevelen, "Coal : typology, physics, chemistry, constitution", 3rd, compl. rev. ed., Elsevier, Amsterdam 1993
2. Martin A. Elliott (ed.), "Chemistry of coal utilization. 2 Supplementary Vol. / prepared under the guidance of the Committee on Chemistry of Coal Utilization", John Wiley & Sons, New York 1981
3. A. Volborth (ed.), "Coal science and chemistry", Elsevier, Amsterdam 1987
4. <http://www.coal.org/briefs/EducationPapers.asp>
5. <http://gcep.stanford.edu>

Assessment:

Assessment of laboratory tests

Rules of final credit: grades for successful completion of laboratory tests